

a hearing aid and education in a special school are important facets of management of a child with significant deafness. Because sclerosteosis is progressive, regular re-evaluation is indicated.

The rise in intracranial pressure which occurs in the majority of patients in early adulthood is a life-threatening complication and prophylactic craniectomy should be considered in this situation. This operation has been carried out successfully in 7 of our patients.

COMMENT

Sclerosteosis is an important and relatively common problem in South Africa. The condition warrants consideration in the differential diagnosis of syndactyly or facial palsy in any child of Afrikaner stock.

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General Practice

The Recognition of Lesions on Chest Radiographs

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SUMMARY

An approach to the recognition of lesions on chest radiographs is outlined.

Four basic groups of abnormalities by means of which lesions can be recognized are mentioned and are briefly described, namely an opacity, an area of increased translucency, a combination of an opacity and an area of increased translucency, and, especially, an alteration in normal radiological anatomy.

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A prerequisite for the recognition of lesions on chest radiographs is that correct views of technically good

quality must be available. What constitutes correct views will depend on the clinical problem, but the minimum number of views required when disease is suspected is two, namely a postero-anterior and a lateral view. In routine examinations (e.g. for employment or visa purposes), especially in young people, a single postero-anterior view would suffice.

A rough measure of correct exposure is that the dorsal intervertebral disc spaces must just be faintly visible through the heart shadow on the postero-anterior view, and that the lung markings must be visible to within 1 cm of the edge of the lung.

Exposures must always be made immediately at the end of a full inspiration. Useful information can often be obtained if additional films are made at the end of full expiration. These must always be taken when there is any suspicion of air trapping, any possibility of aspiration of a foreign body, or any likelihood of a pneumothorax.

Films must routinely be taken postero-anteriorly and

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in the erect position, except in children under the age of 1 year and in bedridden patients, when better films are often obtained if they are made antero-posteriorly with the patient supine.

When there is any problem with interpretation of chest radiographs, postero-anterior and lateral views are not enough, and additional views must be taken. The very first sentence in Benjamin Felson's book, *Chest Roentgenology*,¹ is: 'It always irks me to be confronted, in consultation, with a series of PA and lateral chest tele-roentgenograms strung along a bank of viewboxes. No obliques, no Bucky's, no spots, no tomos, no barium.'

A simple but useful view is one taken with a vertical ray and the patient supine, or one taken with a horizontal ray and the patient in a right or left lateral decubitus position. Without these views it is often impossible to diagnose a small or even a big pleural effusion.

Screening of the chest is sometimes useful and sometimes essential, but must be done *after* films have been taken and examined. Only then will one know what to look for and how to look for it. Screening of the chest before films are taken is an unreliable procedure full of pitfalls, because even gross lesions can be overlooked in this way.

A report on routine screening of the chest, as is done, for example, during a barium meal examination, is of little value and may be misleading. In addition it must be remembered that screening of the chest exposes the patient to a much bigger dose of radiation than does the taking of chest films.

In the examination of any mediastinal or hilar lesion, or even a suspected mediastinal or hilar lesion, a barium swallow examination must be done.

In the examination of any obscure pulmonary lesion, especially bilateral pulmonary lesions, a barium swallow is needed, for this may be the clue to the diagnosis of aspiration pneumonia or lymphangitis carcinomatosa.

Tomography is an easy, exceptionally useful and often essential examination to demonstrate to better advantage and to evaluate pulmonary, hilar and mediastinal lesions, as well as lesions of the pleura and bony thorax. Tomography is often a neglected examination which should be used much more frequently.

HOW DO WE RECOGNIZE LESIONS ON CHEST RADIOGRAPHS?

It is most important that the lung fields and heart shadow should not be examined immediately on viewing the radiograph. Nobody will ever forget to look at the lung fields and heart shadow, but many forget to look at the abdomen, the neck, the shoulders, the breast shadows, the spine, etc. Sometimes the clue to the diagnosis of the pulmonary lesion is found in these structures outside the lungs.

HOW DO WE RECOGNIZE LESIONS IN THE LUNGS?

There are basically four groups of abnormalities, namely: (i) increased density or an opacity; (ii) diminished density

or increased translucency; (iii) combinations of (i) and (ii); (iv) alteration of the normal radiological anatomy.

Increased Density or Opacity

This develops when normal radiolucent air in the lung is diminished in amount, or is partly replaced by a less radiolucent substance, for example inflammatory exudate, inflammatory cells, granulation tissue, fibrous tissue, oedema, malignant cells, calcium deposition, a foreign body or collapsed alveoli due to absorption of air from the alveoli. Opacities vary in size, form and number and may be very dense and very obvious or very faint and difficult to detect.

Diminished Density or Increased Translucency

This depends on diminution in the amount of normal lung structures and/or an increase in the amount of air normally in the lung. Numerous causes and mechanisms may be involved, for example abscess, cystic bronchiectasis, pneumatocele, cavitating carcinoma, air trapping, emphysematous bullae or blebs, arterial obstruction and interstitial emphysema.

Combination of Increased and Diminished Density

This may be found in the same lesion, for example when there is fluid and air with a fluid level in a thin-walled cavity.

Alteration of the Normal Radiological Anatomy

This is often the chief or only clue to the diagnosis and may also help in the localization of a lesion.

Silhouette sign. The best known of these signs is probably the so-called silhouette sign. It can be applied to the heart shadow, the aortic shadow, the dome of the diaphragm, the hilar blood vessels and the intrapulmonary blood vessels. Normally all these structures are sharply outlined by air in the adjacent lung. When this sharp demarcation is obliterated it is referred to as the silhouette sign, and this indicates a lesion adjacent to the edge that is blurred (Figs 1 and 2).

Air bronchogram. The second well-known sign is the so-called air bronchogram. Normally, air-filled bronchi in the lung fields cannot be identified as such because the wall of a normal bronchus is too thin to show up radiologically and there is no contrast between air in the bronchus and air in the alveoli surrounding the bronchus. An air bronchogram develops when air in the alveoli is replaced by radiopaque material while the bronchus remains normally filled with air. The air in the bronchus then shows up in contrast to the surrounding more dense material (Fig. 3). The surrounding density as such is not always detectable, and in such a case the air bronchogram is the chief or even the only evidence of a lesion, and an indication of alveolar disease.

Alteration in the normal gradient of density of vertebral bodies. Normally the vertebral bodies, as seen on a lateral view of the chest, become darker gradually and pro-

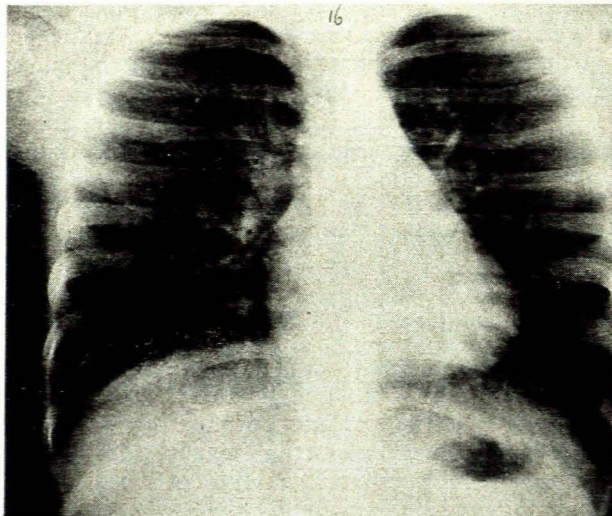
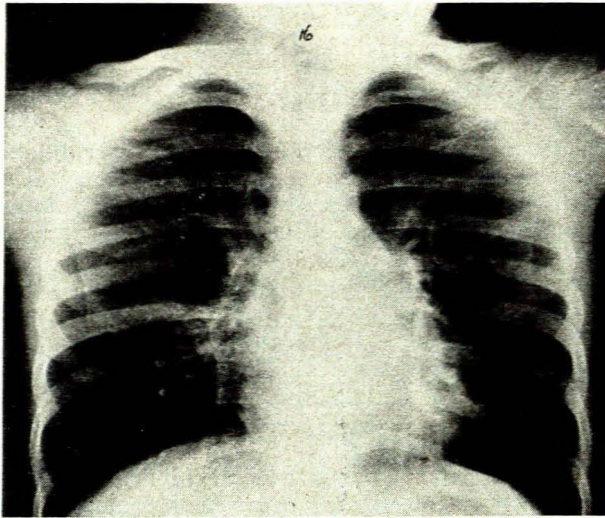


Fig. 1. Top: the silhouette sign as shown by obliteration of the sharp margins of the right and left cardiac borders, indicates a lesion, in this case pneumonia, in the right middle lobe and in the lingula; bottom: the pneumonia has cleared and the cardiac borders are sharply defined.

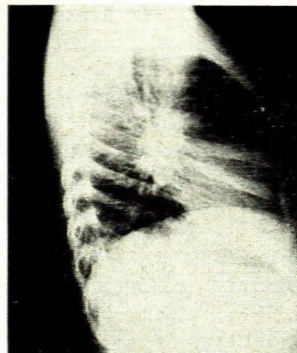
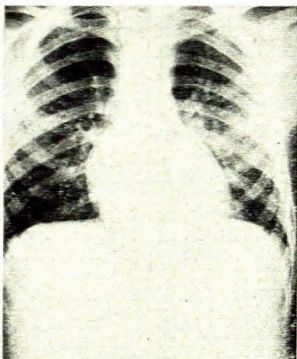


Fig. 2a. The only evidence of a pulmonary lesion is the silhouette sign (seen on the left) obliterating the sharp margin of the posterior part of the left dome of the diaphragm due to segmental pneumonia.

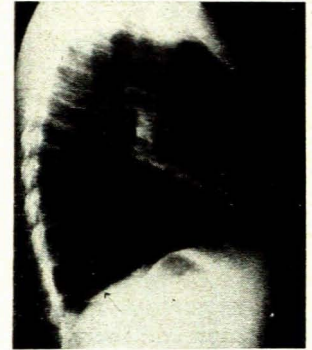
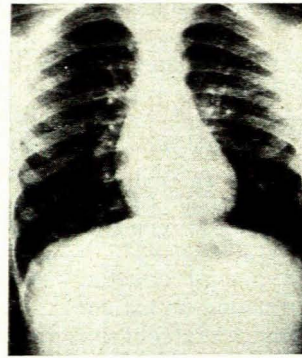


Fig. 2b. The pneumonia has cleared and both domes of the diaphragm are seen in their full extent.

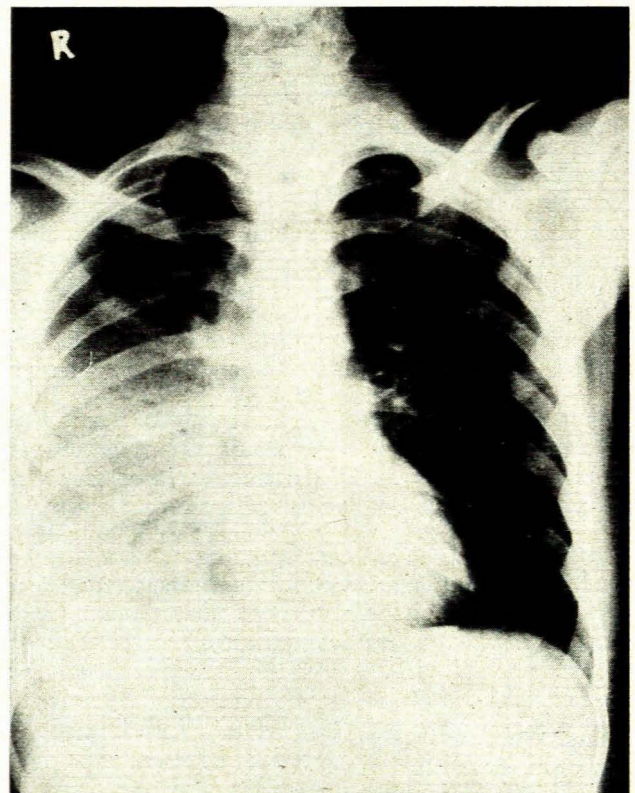


Fig. 3. Air bronchogram in a patient with lobar pneumonia of the right lower lobe. Air-filled bronchi stand out in contrast with consolidated adjacent alveoli.

gressively, that is more translucent as one follows them downwards from the level of D1 to the diaphragm. Any change in this normal gradient in density is an indication of disease (Fig. 4).

Alteration in the ease with which the inter-rib spaces and dorsal disc spaces can be seen through the heart shadow. Normally, on a postero-anterior view of the chest, the inter-rib spaces can be more easily identified through the heart shadow than the disc spaces. Any change in this normal relationship is an indication of disease.

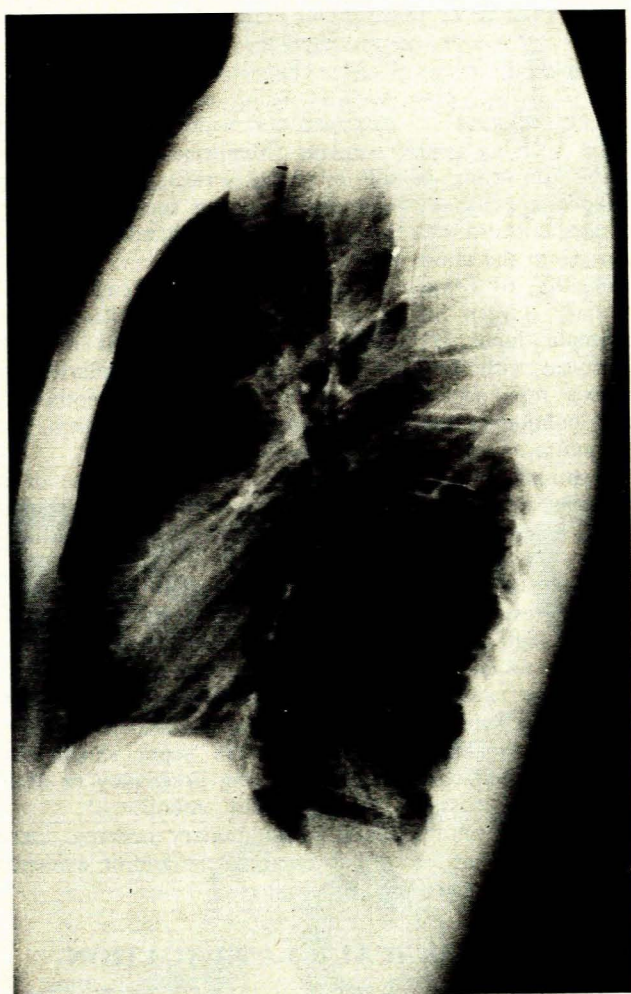
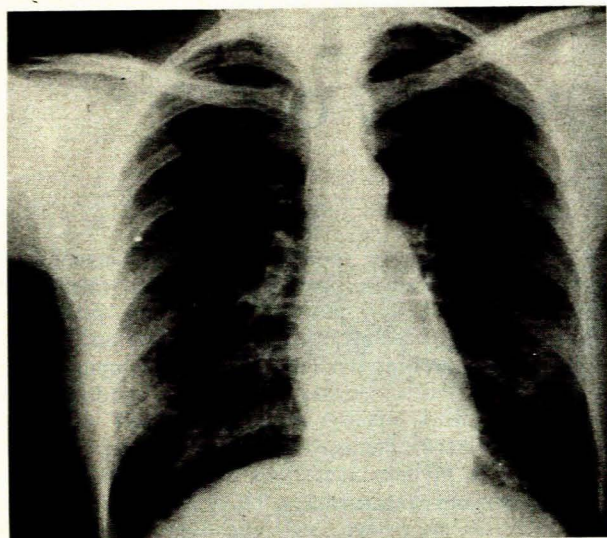


Fig. 4. The main evidence of disease is an alteration in the normal gradient of density of the vertebral bodies as seen on the lateral view. The two lowermost vertebral bodies, immediately above the diaphragm, are lighter instead of darker than those immediately above.

Alteration in the normal position, form, size and density of the hilar shadows. Normal hilar shadows show a fairly wide range of appearances and there are imperceptible grades of change from normal to pathological. There are no reliable measurements which one can apply to hilar shadows, and for interpretation one is dependent on appearance, experience and judgement. Evaluation of hilar shadows is one of the most difficult aspects of chest radiology. It is helpful if in every case one asks oneself specifically whether the particular hilar shadow is within normal limits as regards position, form, size and density.

Alteration in the normal position and form of the interlobar fissures. Often an alteration in the position and/or form of an interlobar fissure is the only evidence of diminution in volume of a segment or lobe due to fibrosis or collapse, or increase in size due to overinflation.

Alteration in the normal gradient in size of blood vessels in the upper and the lower lung fields. Normally there is a gradual change in size from small blood vessels in the lung apex to big vessels at the lung base. Any change in this normal gradient is an indication of disease and it is the earliest radiologically detectable indication of raised pulmonary venous pressure.

Alteration in the normal gradient in size from big blood vessels in the hilum to small blood vessels at the lung periphery. When, instead of the normal gradual change in size, there is an abrupt change in size, it is an indication of disease such as pulmonary arterial hypertension or pulmonary embolism.

Alteration in the normal course of blood vessels from and to the hilar shadows. Normally the vessels spread out fan-wise from the hilar shadows. A change in this normal pattern may be the chief or only evidence of fibrosis or collapse affecting an upper or a lower lobe.

An abnormal blood vessel in the lung may be the clue to the diagnosis of abnormal pulmonary venous drainage, pulmonary arteriovenous fistula or pulmonary sequestration.

Alteration in the normal position and curve of the domes of the diaphragm may be the chief clue in the diagnosis of such diverse conditions as emphysema, collapse of a lower lobe, subphrenic abscess, pulmonary embolism or phrenic paralysis.

Alteration in the normal size and translucency of the retrosternal air space on a lateral view. An increase in the size and translucency of this space is a common finding in emphysema. On the other hand, any retrosternal mass may encroach on this space.

Alteration in the changes that occur normally with dynamic studies such as inspiration and expiration, Valsalva and Muller manoeuvres, sniffing and coughing. These changes play an important role in the diagnosis of phrenic paralysis, subphrenic abscess, pneumothorax, collapse of a lobe, aspiration of a foreign body, air trapping, MacLeod's syndrome, the differentiation of emphysematous bullae from cystic bronchiectasis, and the differentiation of enlarged hilar or azygos vessels from enlarged glands.

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